CLAIMS

1. A process for forming an intermediate preform for manufacturing a microstructured optical fibre, comprising:
   - providing a cylindrical mould (20) defining a central axis (29), said mould comprising a cylindrical container wall (21), a first base (22) and a removable second base (25);
   - arranging within said mould a plurality of hole generating elements (23), apt to define internal structural elements of the intermediate preform;
   - inserting a fluid optical polymer material or polymer precursor (11) in the mould;
   - consolidating the fluid polymer material or polymer precursor so as to obtain a solid cylindrical polymer body (30) defining the intermediate preform and having embedded the hole generating elements;

   characterized in that said hole generating elements are releasably fixed to said first and to said second base and comprise at least one hole generating element removable from said intermediate preform, and in that the process further includes:
   - releasing said hole generating elements from said first and second base;
   - removing the second base from the mould;
   - removing the cylindrical intermediate preform from the mould, together with the therein embedded hole generating elements;
   - removing said removable hole generating element for forming an elongated hole (41) inside the intermediate preform by applying a load to said removable hole generating element.

2. A process according to claim 1, wherein said removable hole generating element has a diameter comprised between about 2 and 8 mm.

3. A process according to claim 2, further comprising, before pouring said polymer precursor in the mould, coating said removable hole generating element with a low adhesion layer.

4. A process according to claim 3, wherein said low adhesion layer is a tube arranged over the removable hole generating element.

5. A process according to any of claims 3 or 4, wherein said low adhesion layer comprises a low adhesion fluororesin.

6. A process according to claim 1, wherein said removable hole generating element is electrically conductive and said step of removing includes heating said removable hole generating element by flowing an electrical current through it, so as to partially melt a portion of the intermediate preform proximal to the removable hole generating element.

7. A process according to claim 6, wherein said removable hole generating element is a metal wire.

8. A process according to claim 7, wherein said metal wire is made substantially of stainless steel.

9. A process according to claim 6, wherein said removable hole generating element has a diameter comprised between about 0.1 and 2.0 mm.

10. A process according to claim 9, wherein said removable hole generating element has a diameter comprised between about 0.3 and 1.0 mm.

11. A process according to any one of claims 6 to 10, further comprising heating said intermediate preform with said elongated hole at a temperature greater than the glass transition temperature T_g, at a pressure lower than about 0.2 bar, for a time sufficient to substantially remove the monomer resulting from depolymerisation in said portion of the intermediate preform proximal to the removable hole generating element.

12. A process according to claim 1, wherein said plurality of hole generating elements comprise a plurality of hole generating elements (23) removable from said intermediate preform and wherein the process comprises removing said plurality of removable hole generating elements for forming

a predetermined pattern of elongated holes (41) in the intermediate preform.

13. A process according to claim 12, wherein the plurality of removable hole generating elements (23) is, prior to removal of the intermediate preform from the mould, symmetrically arranged around said central axis (29) of the mould.

14. A process according to claim 1, wherein the plurality of hole generating elements comprise one central hole generating element coaxial to said central axis of the mould.

15. A process according to claim 1, further comprising, after arranging within said mould a plurality of hole generating elements, isolating the mould from the outside and cleaning the mould by recirculating through it a liquid and filtering said liquid.

16. A process according to claim 1, wherein inserting a fluid optical polymer material or polymer precursor comprises pouring a polymer precursor (11) in the mould and wherein consolidating the polymer compound comprises polymerising the polymer precursor.

17. A process according to claim 16, wherein said polymer precursor is one of a monomer or a prepolymer.

18. A process according to claim 1, wherein inserting a fluid optical polymer material or polymer precursor comprises pouring or injecting a molten polymer in the mould and wherein consolidating the polymer material or polymer precursor comprises cooling the molten polymer so as to solidify it.

19. A process according to claim 1, wherein inserting a fluid optical polymer material or polymer precursor comprises inserting a powdered polymer in the mould and wherein consolidating the polymer material or polymer precursor comprises sintering the powdered polymer.

20. A process for producing a calibrated intermediate polymer preform for manufacturing an optical fibre, comprising:
- forming an intermediate polymer preform of elongated shape (40) having an elongation axis, the polymer having a predetermined glass transition temperature T_g;

characterized in that the process further includes calibrating said intermediate preform, wherein calibrating comprises:
- stretching the intermediate preform during a stretching period by heating it (51) at a predetermined stretching temperature above T_g and applying a tensional load (F) to the intermediate preform along its elongation axis, so as to cause its straining along the elongation axis, the stretching temperature, the tensional load and the stretching period being selected so as to impress a viscoelastic deformation to the intermediate preform;
- cooling the intermediate preform (50) to a temperature below T_g during a cooling period, while maintaining the stretched preform in tension, so as to avoid a substantial release of said viscoelastic deformation;
- inserting the intermediate preform in a calibration tube (53) having a cylindrical inner shape; and
- heating (52) the intermediate polymer preform to a calibration temperature above T_g during a calibration period sufficient to achieve a substantial release of said viscoelastic deformation.

21. A process according to claim 20, wherein heating the intermediate polymer preform to a calibration temperature is performed at a pressure lower than about 0.2 bar.

22. A process according to any of claims 20, 21, wherein the stretching temperature is comprised between about T_g + 10°C and T_g + 100°C.

23. A process according to any of claims 20-22, wherein the stretching period is comprised between about 1 and 100 min.

24. A process according to any of claims 20-23, wherein forming an intermediate polymer preform of elongated shape comprises:

- inserting a fluid optical polymer material or polymer precursor (11) in a cylindrical mould (20);
- consolidating the optical polymer material or polymer precursor so as to obtain a cylindrical polymer body (30) defining the intermediate preform; and
- removing the cylindrical polymer body from the mould.

25. A process for structurally modifying a polymer preform comprising sleeving a calibrated intermediate polymer preform (45), produced according to any of claims 20-24, by applying a plastic member externally to the calibrated intermediate preform so as to obtain a sleeved preform (59).

26. A process according to claim 25, wherein applying a plastic member externally to the calibrated intermediate preform comprises inserting the intermediate preform in a plastic tubular member.

27. A process according to claim 25, wherein applying a plastic member externally to the calibrated intermediate preform comprises polymerising a fluid optical polymer material or polymer precursor around the calibrated intermediate preform.

28. A process according to any of claims 25-27, comprising repeating one or more times the steps of calibrating and sleeving so as to produce a final preform (59).

29. A process according to any one of claims 25-28, further comprising drawing the sleeved preform or the final preform (59) to obtain an optical fibre (61).

30. An optical preform (59) as obtainable by the process of any one of claims from 1 to 28.

31. An optical fibre (61) as obtainable by the process of claim 29.